motion of the comet of Encke were already well prized by all men of science. The *Memoirs* of the Academy contain this year a new work by Prof. Asten, on all the appearances of that comet from 1819 to 1875. M. Asten has published also new ephemerides of the comet for this year, and their precision was already proved by the numerous observations made in the southern hemisphere. Unhappily he could not see this brilliant confirmation of his researches, death having taken him from the ranks of men of science.

Prof. Bredikhine was engaged in very interesting researches into the tails of comets, and he established that there are three quite different kinds of tails, according to the different relations between the attractive and the dispersive force of the sun, which last is modified by the different properties of the particles of which the tail is formed. Spectral analysis will probably confirm this hypothesis.

As to spectral analysis in its application to heavenly bodies, the report states that it is not based, as yet, on sufficiently positive data, and that to elaborate these data with the accuracy usual to other astronomical observations, is the special aim of the astro-physical department of the Pulkova Observatory. Thus M. Hasselberg has published two works, one of which reduces the observations of Kirchhoff to wave-lengths, and the other deals with a precise description of the spectra of absorption of NO_2, and bromine. The same author has recently proved that the displacement of spectral lines does not depend upon the density of the gas.

Observations on the variations of luminosity of stars were pursued by M. Lindemann, who has added 42 other stars to the 280 variable stars, included in the catalogue of M. Sjölerup. Prof. Savitch has made observations on oppositions of planets and on the transit of Mercury. He has also read at the Academy a paper on corrections on the pendulum of Repsold. Finally, we notice the observations of M. Njuren on earthquakes, as noticed by vibration of the sensitive levels of astronomical instruments.

In physical science the report begins with the work of the Central Physical Observatory at St. Petersburg. The Director of the Observatory, Prof. Wild, has a memoir on the determination of the real temperature of the air by a thermometer, and on the precautions to be taken for avoiding various secondary influences on the instrument, especially those of radiation. Thermometers which allow the determination of the temperature of the air with a precision of one-tenth of degree, have already been introduced into Russian meteorological stations. Besides, Prof. Wild has proposed very satisfactory improvements in the siphon barometer which allow easily the transportation of the barometer dismounted, without changing its error, and thus afford a means for comparing with great accuracy the normal barometers of different stations. After having given, during the preceding years, special attention to terrestrial magnetism, the Central Physical Observatory has occupied itself with atmospheric pressure, and Capt. Rykatcheff has published a paper on the diurnal changes of barometrical pressure, based on the observations of eleven Russian and twenty-four foreign stations. The theory for explaining the diurnal changes of pressure, proposed by M. Rykatcheff, seems to be more probable than that of Dove, usually accepted until now. Among other meteorological papers, published by the Academy, there are worthy of notice those by Prof. Lenz, on the Galvanic Resistance of Solutions of Salts of Kalium, Natrium, and Ammonium; by Capt. Rykatcheff, on Winds on the Baltic; by M. Dorandt, on Anemometers; by M. Hellmann, on the Comparison of the Normal Barometers at St. Petersburg, Helsingfors, Dorpat, Stockholm, and Upsala; and by M. Stelling, on the Intensity of Day-Light at St. Petersburg.

In chemistry Prof. Menshutkin has continued his researches on the Influence of the Isomerism of Alcohols and Acids on the Formation of Compound Ethers; and the Report notices among the chemical papers which have appeared in the publications of the Academy, those by Mrs. Lermantoff, on the Influence of the Tertiary Sodic Butyl on Isobutylene, and by M. Paoloff and Jawein, on Organic Chemistry.

In geology the year 1878 is marked by the appearance of the most important work, by Prof. Frederick Schmidt, on Silurian Trilobites of the Eastern Coasts of the Baltic, being the result of twenty years' researches, and of a thorough comparison of Russian trilobites with those of other countries. The work will contain the description of about 140 species; the first fascicule, actually in the press, contains a general description of the silurian rocks in the governments of St. Petersburg and Esthonia. Prof. Meller has described the collections brought from the Manyeh by M. Danilcosky, and has proved the former extension of the Caspian very near to the Sea of Azov.

In botany the first place is occupied by the work on the Algæ of the White Sea, by M. Gobi. Prof. Famintzin has continued his researches into the embryology of plants, and by means of preparations made on the method of Nestermeyer, he has arrived at important results as to the formation of tissues in the embryons of plants. M. Klinge has made very interesting histological researches on roots of several Monocotyledons.

In zoology Prof. Brandt has published important additions to his former work (appeared in 1877) on the Rhinoceroses, living and extinct. But the most interesting of his works is certainly that on the Elasmotherium. Judging by the few teeth, found until now, of this extinct mammal, which formerly inhabited Europe from the Rhine to the Kirghiz Steppes, Prof. Brandt had described the elasmotherium as a form of the family of rhinoceros, but very near akin to the horse. A complete skull of this animal, which was recently found at Sarepta, on the Volga has quite confirmed the opinions of this zoologist. The elasmotherium is most nearly related to several kinds of rhinoceros, having at the same time several features common with the horse, and forms a separate sub-family of rhinoceros; he lived at the same time as the bison, the rhinoceros, tichorhinus and man. Prof. Kessler gives interesting descriptions of new fishes from Central Asia. M. Mereshkofsky has explored the sponges of the White Sea, and M. Boetger is publishing an important monograph on the *Clausiliæ*. Finally, the Report mentions the works of Prof. Ovsiannikoff on the anatomical structure of the cerebrum of the dolphin and other vertebrata, and the papers by Prof. Gruber, on variations of the muscles and the bones of man.

In the report of the historico-philological section of the Academy we mention the works of Prof. Dorn on inscriptions in the Pelegvian language and on the Semnan language, a now nearly extinct branch of the Iran branch; and memoirs, by Prof. Schiffner, on Buddhism; and by Prof. Wideman, on Finnish languages, namely, of that of Zyryans.

As to the premiums awarded by the Academy, those bearing Lomonosoff's name, for works in chemistry, physics, and mineralogy, and Buniakofsky's, for works in mathematics, were not awarded this year. A new premium, bearing the name of Helmersen, was founded this year for works in geology.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

PROF. JAMES STUART'S efforts to develop a school of Applied Science at Cambridge, have produced further fruit in the shape of a report of the Board of Mathematical Studies, recommending an alteration in the scheme of examination in mechanism and applied science for the ordinary B.A. degree. It is proposed now that papers on mechanics and on heat shall be obligatory on all candidates, while they shall choose one only of three other subjects, viz., (1) Mechanism. (2) Theory of Structure, Strength of Materials, and Principles of Surveying and Levelling. (3) Electricity and Magnetism. The examination is to be made as far as possible a satisfactory basis for a professional career by its practical character. Thus every candidate will be required to show his ability to write an accurate description or specification of an instrument, machine, or model exhibited, and to make a working sketch to scale. Evidence of actual capacity to use the tools or instruments belonging to the subject selected by the candidate will be demanded. The first class in the class list is to consist only of those who have distinguished themselves in one of the three alternative subjects. We do not doubt that it will soon be realized that a student who has to pass an examination in Greek and Latin in his second year will not have time to master his Science subjects by the end of the third. There will be much more chance of attracting students of Applied Science to Cambridge if they are excused from the classical portions of the "General" Examination for the ordinary degree.

IN the new scheme for the Classical Tripos at Cambridge, the advanced portion will include several groups of subjects, of which one only is to be selected by a candidate. Three of these groups are History, Archæology, and Language, and the knowledge and treatment required will be thoroughly scientific in character. Archæology will include papers on Greek and Roman

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mythology and religion, on topography and monuments, and on art and handicraft and the inscriptions of the Greeks and Romans, in relation to their domestic and national life. The Language group will include elementary Sanskrit, the comparative grammar of the Indo-European languages, and the history of alphabets.

FORTUNATELY the demands of science are sometimes so urgent, that they cannot be resisted, as in the case of the School of human anatomy at Cambridge, which has so outgrown its accommodation that a new dissecting room must be immediately provided, pending the expected erection of really adequate buildings for the medical schools some years hence. There are sixty students dissecting this winter, under Dr. Creighton, and several assistant demonstrators. In the interests of health and education, a large room is to be built over the present lower rooms at a cost of 600*l*., which will supply the pressing need of space.

IT is satisfactory to learn that physical science will be represented among the three representatives of Trinity College sitting with the Cambridge University Commissioners, by Mr. Trotter, who has taken a very influential part in framing the new statutes of his college, and that Prof. Bonney is one of the representatives of St. John's College. We wish that we might hear that other colleges sent equally accredited men of science to strengthen the cause of physical science before the commissioners.

A VACANCY having occurred in the professorship of botany at the University of Innsbruck by the transference of Kerner to the important chair at Vienna as successor to Fenzl, Dr. Peyritsch, director of the botanic garden at Vienna, has been appointed to the professorship at Innsbruck.

THE Zurich University has just granted the diploma of Doctor of Philosophy to Miss Helene Druschkovitsch, from Vienna, after a brilliant defence of her dissertation on the "Don Juan" of Byron.

THE Geneva University numbers 391 students, of whom 208 are not matriculated. Out of the 391 students 212 are Swiss, and the others are strangers; there are forty-five ladies, of whom five, Russian, are matriculated.

SCIENTIFIC SERIALS

Zeitschrift für wissenschaftliche Zoologie, vol. xxxii., part 1. —J. Brock on the sexual organs of cephalopoda, first memoir, dealing with sepia, loligo, sepiola, eledone, pp. 116, 4 plates. F. E. Schultze, researches on sponges, sixth part, the genus spongelia, 41 pp., 4 plates.—L. Löwe, on the anatomy of the gills of serpula, 30 pp., 1 plate.

Morphologisches Jahrbuch, vol. iv. part 4.—Contribution to the anatomy and histology of the sexual organs of osseous fishes, by J. Brock, Erlangen, 68 pages, describing very many forms, 2 plates, with figures from eleven genera.—The folds of the mucous membrane in the human palate, by C. Gegenbaur, with 1 plate, giving a comparison between the palatal markings of human fœtuses and those of the orang, cercopithecus, and ateles. —On the female sexual apparatus of *Echinorhynchus gigas*, by A. Andres, 1 plate.—The extensor muscles of the calf and foot of mammals, by G. Ruge, a very extensive inquiry, 52 pages, 4 plates, followed by another from the same author on the deep muscles of the sole of the foot, with 2 plates.—On *Labyrinthodon Rütimeyri*, by R. Wiedersheim.—On the homology of segmental organs in annelids and vertebrates, by Max Fürbringer.

Kosmos, November.—On Bacon of Verulam, the founder of modern realism, by Fritz Schultze.—The origin and evolution of sensory organs (eye and ear), by Ernst Haeckel.—Colour in animals and plants, by A. R. Wallace, translated from the English.—On the political constitution in primitive grades of culture, by M. Kulischer.—Report of the meeting of the German Anthropological Society.

December.—On the discovery of the soul, by G. Jäger.—Colour in animals and plants, by A. R. Wallace, concluded.—The elasmotherium of the diluvium.

January.—Philosophic reflections on the nebular hypothesis, by Carl du Prel.—The mathematical basis of the structure of the plant body, by Dr. S. Gunther.—Dissimilarity between the male and female of *Epicalia acontius* by Fritz Müller.—Primitive constitution; part 2, federation, by M. Kulischer.

THE *Bulletin de l'Académie impériale des Sciences de St. Pétersbourg* (t. xxx. No. 3) contains the following papers of interest:—On an application of the finite differential calculus, by F. Minding.—On some extraordinary muscles, tensores fasciæ suralis, in man, by Dr. W. Gruber.—On a new species of ossiculum supernumerarium carpi in man, by the same.—Palæontological observations regarding M. Danilewsky's journey to the Manytsch, by V. Möller.—Supplementary observations to a monograph of the *Rhinoceros tichorhinus*, by J. F. Brandt.—New researches on the ichthyology of Central Asia, by K. Kessler.—On the tail of comets, by M. Bredikhine.

THE *Sitzungsberichte* of the Vienna Academy of Sciences (Physical, Chemical, and Astronomical Section, vol. lxxvi. parts 2–5, vol. lxxvii. parts 1–3) contain the following papers of interest:—On some maxims and proofs of the theory of the resultant, by Dr. B. Igel.—On a relation corresponding to the linear differential equations of the second order, by Dr. A. Winckler.—Researches on the compounds of the camphor group, by J. Kachler.—On the state of heat equilibrium of a system of bodies with reference to gravitation, by J. Loschmidt. —On a new radiometer, by Dr. J. Puluj.—On the substances found in crude anthracene, by Dr. O. Zeidler.—On the behaviour of camphor towards chloral hydrate, by the same.—On the orbit of Loreley (165), by Dr. G. Gruss.—On the behaviour of acetylene towards concentrated sulphuric acid, by S. Zeisel.—Researches on the heat-conducting capacity of cotton, sheepswool, and silk, by J. Schuhmeister.—On the action of ammonia upon isatine, by Dr. E. von Sommaruga.—On idryl, by Dr. G. Goldschmiedt.—On the action of hydrochloric acid upon resorcine, by L. Barth and H. Weidel.—On the behaviour of certain resins and resinous acids when distilled over zinc dust, by G. Ciamician. On the smallest absolute number of sound impulses which is necessary for the production of a tone, by Prof. Pfaundler.—Report on Egger's electro-magnetic motor, by Prof. R. Handmann.—On the stand-aneroid-barometer, by Dr. Anton Schell. —On citramalic acid, by Th. Morawski.—On the temperature of Vienna, deduced from observations during a century, by Dr. J. Hann.—On a partial differential equation of the first order, by Dr. Franz Hocevar.—On the connection of n different straight lines in a plane, and certain other mathematical maxims, by S. Kantor.—On the magnitude and position of the optical elasticity axes in gypsum, by V. von Lang.—On mononitropyrocatechine, by Dr. R. Benedikt —On some problems in the theory of elastic after-effects, and on a new method of observing oscillations by means of mirrors, without incumbering the oscillating body with a mirror of considerable mass, by Dr. L. Boltzmann.—On the orbit of Laurentia (162), by K. Zeller.—On the application of Doppler's principle on the progressing motion of luminous gas molecules, by Prof. Pfaundler.—On some mathematical maxims relating to cone projections, by E. Weyr.—On the chemical nature of peptone and its relation to albumen, by Dr. E. Herth.—On the barometrical pressure at Vienna, by Dr. J. Hann.—On a new apparatus for the direct volumetric determination of the moisture of the atmosphere, by Prof. Fr. Schwackhöfer.—On the heat-capacity of mixtures of methylic alcohol and water, by E. Lecher.—On the electric after-currents of transversely magnetised iron rods, by Prof. H. Streintz.—On the velocity of transmission of spark-waves, by E. Mach, O. Tumlirz, and C. Kögler.—On the behaviour of propylglycol at a high temperature, by E. Linnemann.—On the direct transformation of isobutyl iodide into trimethylcarbinolamine, by B. Brauner.—On the artificial malic acid made from fumaric acid, by F. Loidl.—On Maxwell-Sympson's synthesis of acroleïne from acetone diiodide, by Dr. O. Voelker.—On the behaviour of β bibromopropionic acid towards iodide of potassium, by V. von Zotta.—Determination of the orbit of comet II 1874, by E. Wenzel.—On Ampère's electrodynamic fundamental experiments, by A. von Ettingshausen.—On bixine, by C. Etti.—On the decomposition products obtained by fusing hydrate of potash with an ammonia gum resin from Marocco, by Dr. G. Goldschmiedt.—On the action of bromine upon phenoldisulphonic acid, by M. von Schmidt.—On the construction of tangents to a rotation plane, by H. Drasch.—On some oxidation products of protocatechic acid, by Dr. M. Gruber.—On trisulfoxybenzoic acid, by Dr. M. Kretschy.—On the variation tone observed by Dvorak, by A. Haberditzl.—On the reduction of ellagic acid by means of zinc dust, by L. Barth and G. Goldschmiedt.—On a fluorescine-carbonic acid, by Dr. J. Schreder.—On the galvanic polarisation of platinum in water, by Franz Exner.—On trinitro- and trinitrophloroglucine, by Dr. R. Benedikt.—On the determination of the focus of the outlines of planes of the second degree, by C. Pelz.—On a synthesis

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